DIAGNOSTICS FOR HIGH DENSITY IMPLOSIONS AT NOVA AND THE NATIONAL IGNITION FACILITY

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The proposed National Ignition Facility (NIF) is a large (1.8 MJ on target at 0.35 μm) multi-beam laser facility that will be used for Inertial Confinement Fusion (ICF). ICF implosions at this facility will produce core plasma temperatures over 10 keV and densities over 100 g/cm^3. Properties of these plasmas can be measured by a variety of optical, x-ray and nuclear diagnostic techniques such as those used at existing facilities like the Nova laser at the Lawrence Livermore National Laboratory and the Omega laser at the University of Rochester. Some of these currently used techniques will be directly applicable to NIF; others, require significant development. A major part of the diagnostics work at LLNL is currently diagnostics development for NIF and prototyping at Nova and Omega. Damage of components close to the target will be a much greater issue at NIF, necessitating the development of distant detector techniques. X-ray based core diagnostics will need to utilize substantially higher energies than are in routine use today. Penetrating nuclear particle based diagnostics will be particularly well suited to these implosions and the higher nuclear yields will allow new techniques to be developed. A summary of diagnostics used for high density implosion experiments at Nova will be presented and development of new techniques for NIF will be discussed.

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